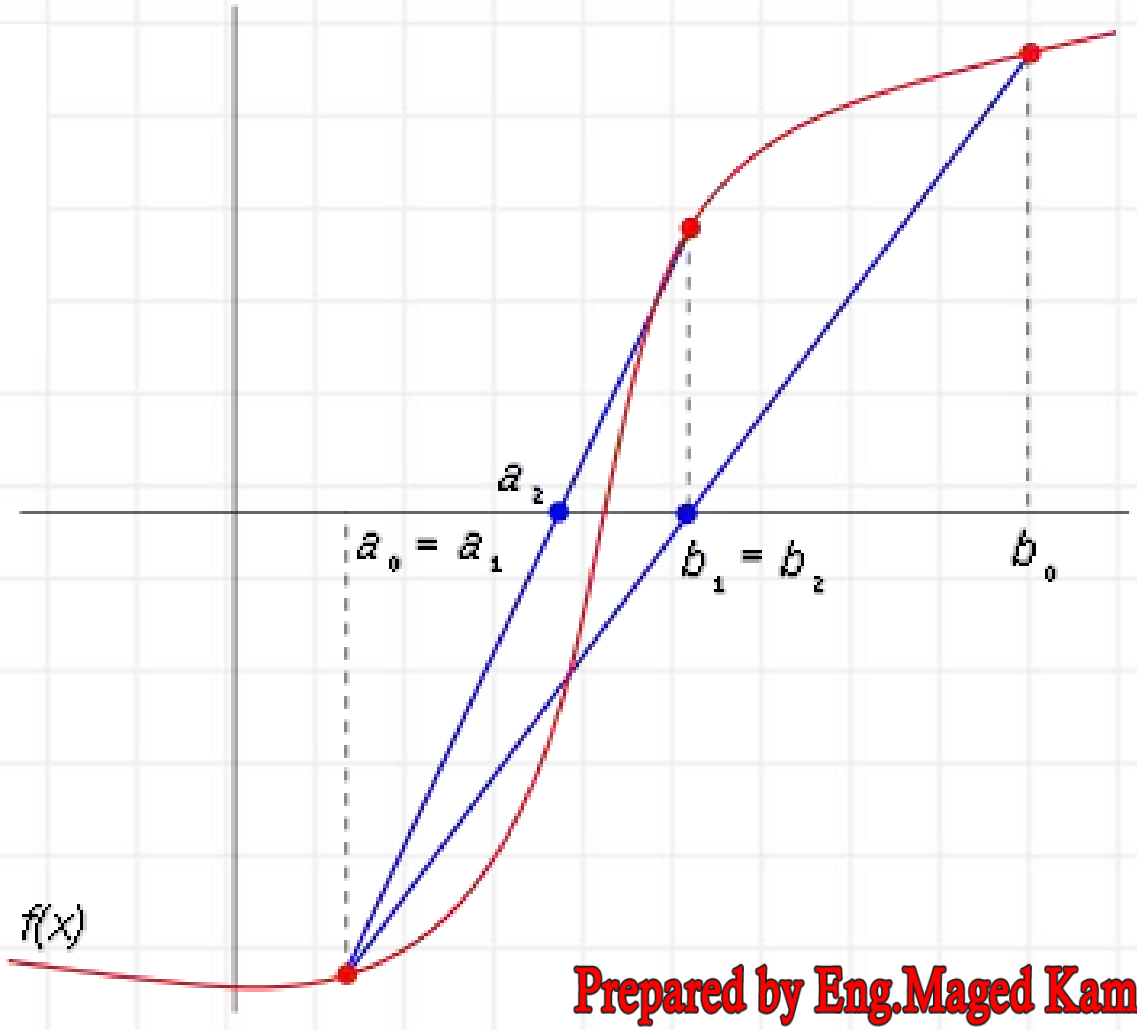
Method of false position.(Regula falsi)

This method creates a false position , by joining the f(b_0) & f(a_0) by a chord thus creating a new position of x root, that is shifted from the original x_r .

Instead of bisecting a new point will be selected based on the next relation.

$$x_r = \frac{(b_0 * \mathrm{f}(a_0) - a_0 * \mathrm{f}(b_0))}{\mathrm{f}(a_0) - \mathrm{f}(b_0)}$$

Note that x_r is measured from left When a_0 at the left and b_0 at the right side



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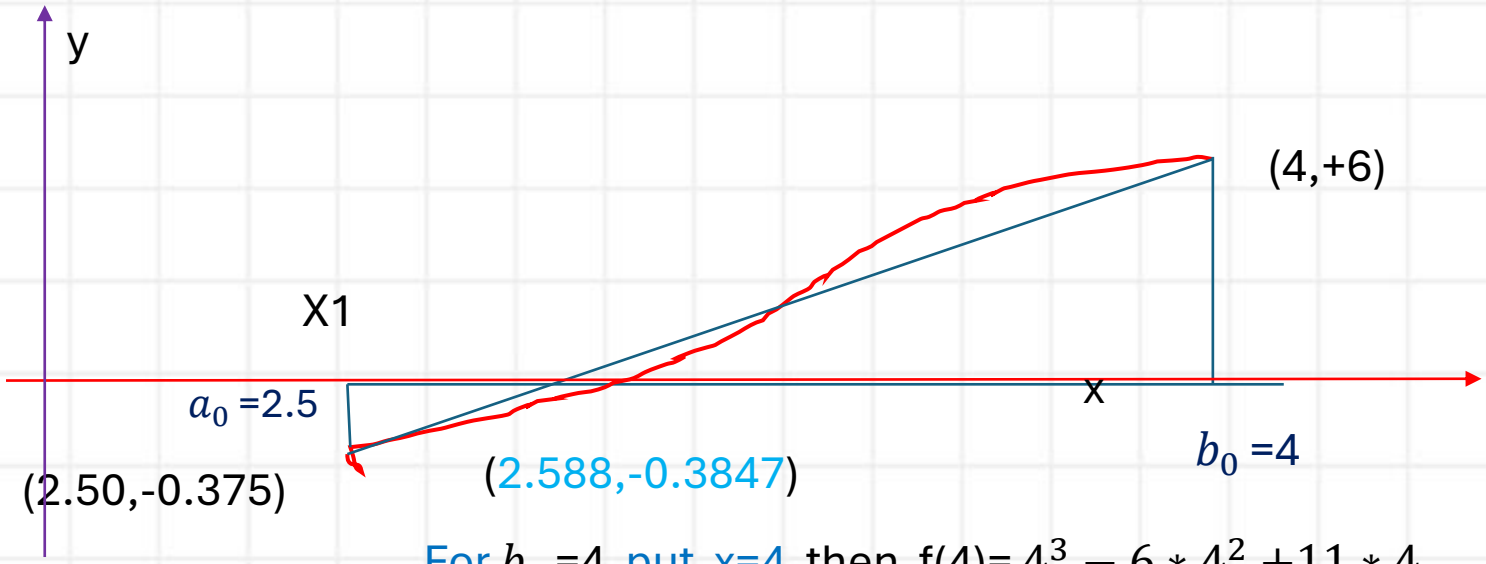
Check if f(a_0)*f(b_1) <0

Check if f(a_0)*f(b_1) >0

Example - If f(x)=$x^3 - 6x^2 + 11 * x - 6$, find the zeros for the function by False position method, consider $a_0 = 2.5, b_0 = 4$,*as before in the previous method .*

Solution

For a_0 =2.5 put x=2.5
then f(4)= $2.5^3 - 6 * 2.5^2 + 11 * 2.5$
= -0.375



For b_0 =4 put x=4 then f(4)= $4^3 - 6 * 4^2 + 11 * 4$
= 64- 96+ 44 – 6 = +6

First iteration.

$$x_r = \frac{(b_0 * f(a_0) - a_0 * f(b_0))}{f(a_0) - f(b_0)}$$

$$= \frac{(4 * -0.375) - (2.50 * 6)}{(-0.375 - 6)} = 2.588$$

$$\frac{(4 * (-0.375) - (2.50 * 6)}{(-0.375 - 6)}$$

f(2.588)= $2.588^3 - 6 * 2.588^2 + 11 * 2.588$ = -0.3847

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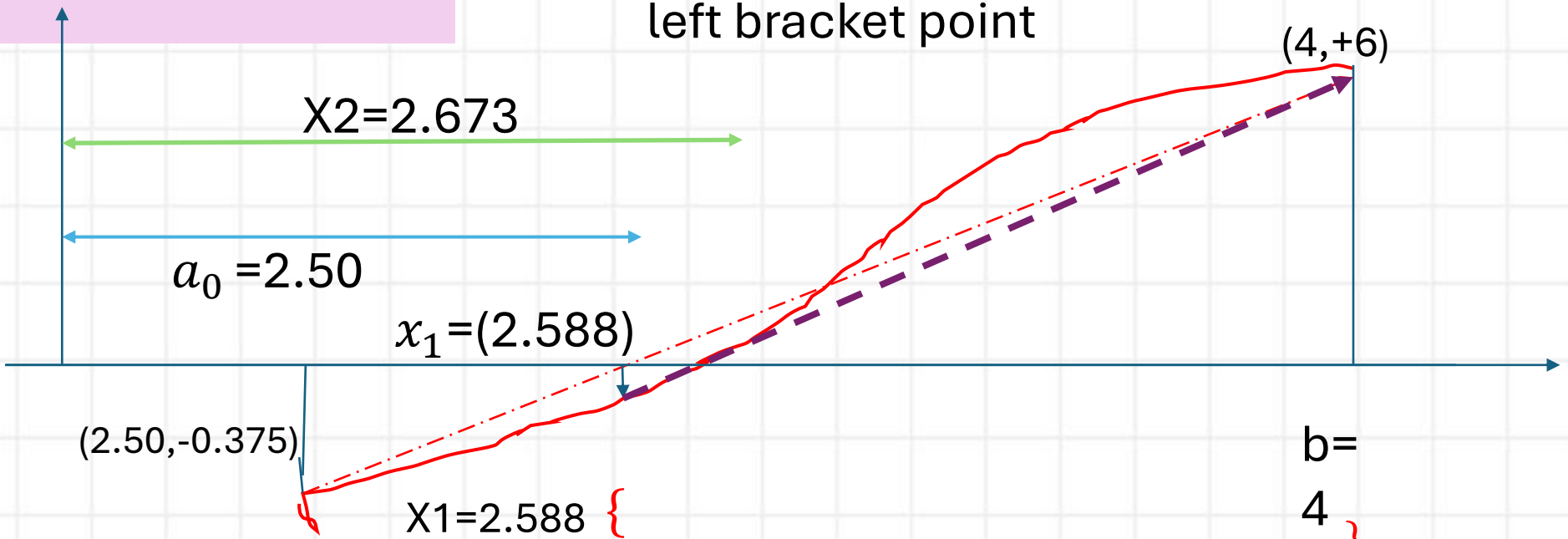
f(2.588)*f(4)=-0.3847*+6=-2.3082

(x_1) will be our new left bracket point



f(2.588)= -0.38469

put a_0 =2.588 & b_0 =4

2nd iteration. x_2 = 2.673

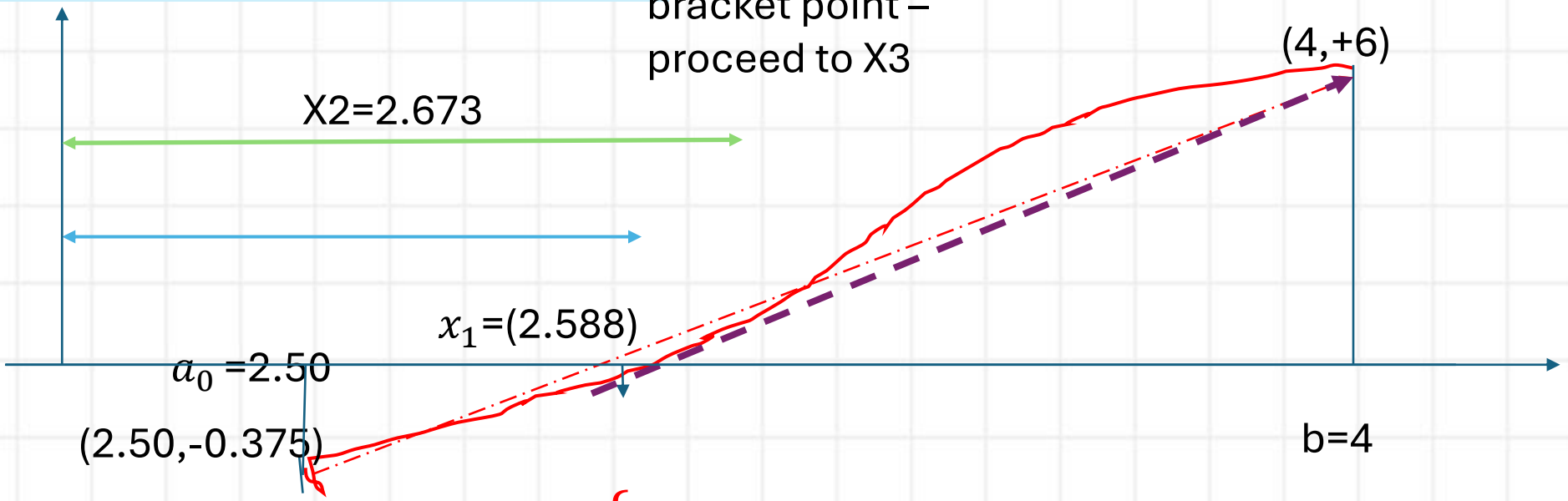
f(2.6732)= -0.36801

Check if f((x_2)*f(b_0) < 0 $\frac{(4*(-0.38469)-(2.588*6)}{(-0.38469-6)}$

Check if f((x_2)*f(b_0) > 0

f(2.6732)*f(4)=-0.36801*+6=-2.2084

f(2.6732)*f(4)=-(0.36801)*+6=-2.2084 Will be our new left bracket point – proceed to X3



X1=2.588 { }

X2 =2.673 { }

X3 = 2.749 { }

X4=2.8147 { }

3rd iteration.

$$\frac{(4 * (-0.36801) - (2.6732 * 6)}{(-0.36801 - 6)}$$

X3= 2.7499

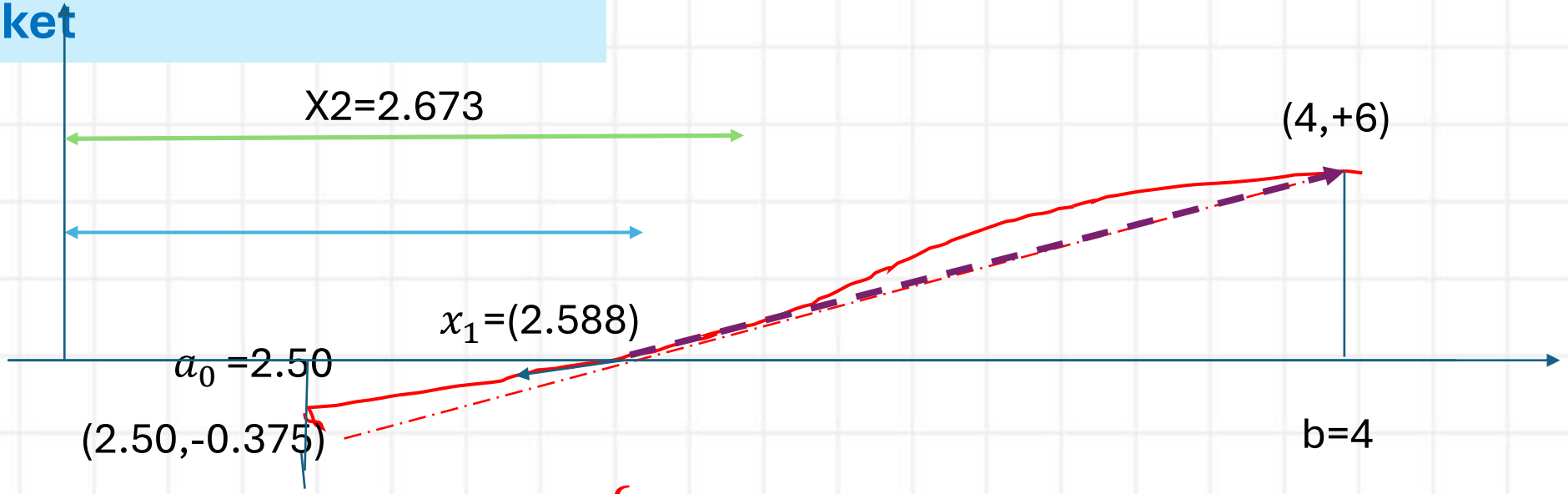
f(2.7499))= $2.7499^3 - 6 * 2.7499^2 + 11 * 2.7499 =$ = -0.328

f(2.7499)*f(4)=-0.328*+6 = -1.9688
Left bracket

f(2.7499)*f(4)=-0.328*+6 = -1.9688

Left bracket

Proceed to X4



X1=2.588 { }

X2 =2.673 { }

X3 = 2.749 { }

X4=2.8147 { }

4rth iteration.

$$\frac{(4 * (-0.328) - (2.749 * 6)}{(-0.328 - 6)}$$

X4 = 2.8417

f(2.8417))= $2.8417^3 - 6 * 2.8417^2 + 11 * 2.8417$ = = -0.274

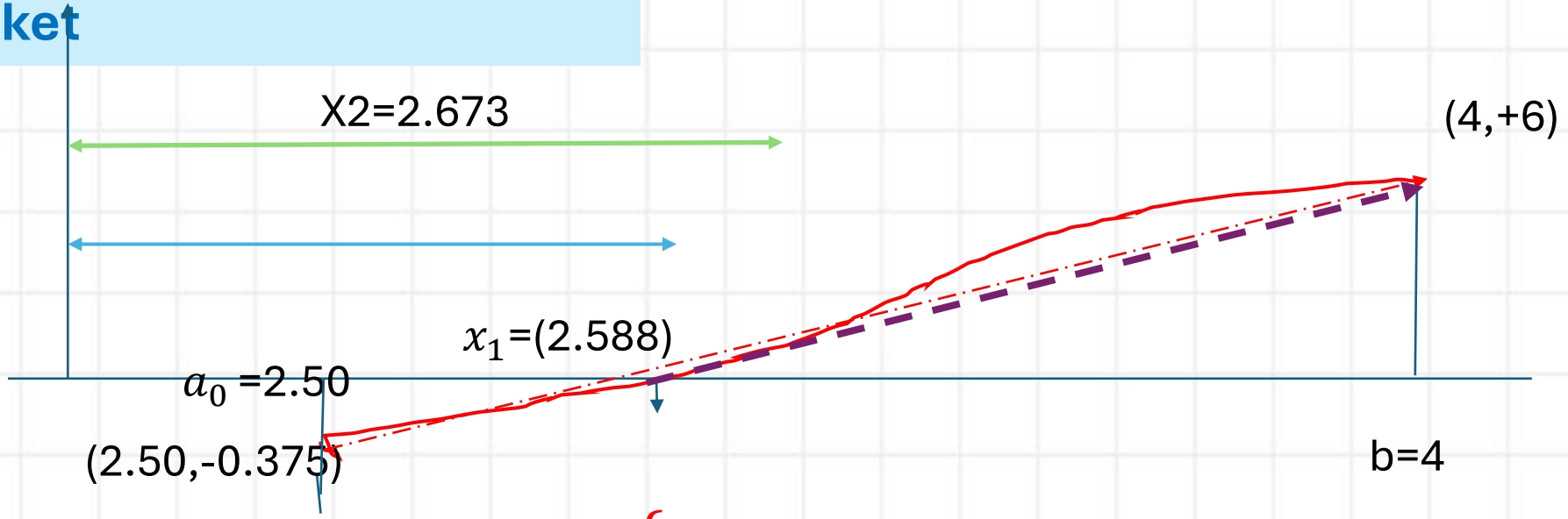
f(2.8417)*f(4)=-0.274*(+6)= -1.643

Left bracket

f(2.8417)*f(4)=-0.274*(+6)= -1.643

Left bracket

Proceed to X5



X1=2.588 { }

X2 =2.673 { }

X3 = 2.749 { }

X4=2.8147 { }

X5=2.866 { }

5th iteration.

$$\frac{(4*(-0.274)-(2.8417*6)}{(-0.274-6)}$$

X5 = 2.866

f(2.866))= $2.8866^3 - 6 * 2.866^2 + 11 * 2.866$ = = -0.216

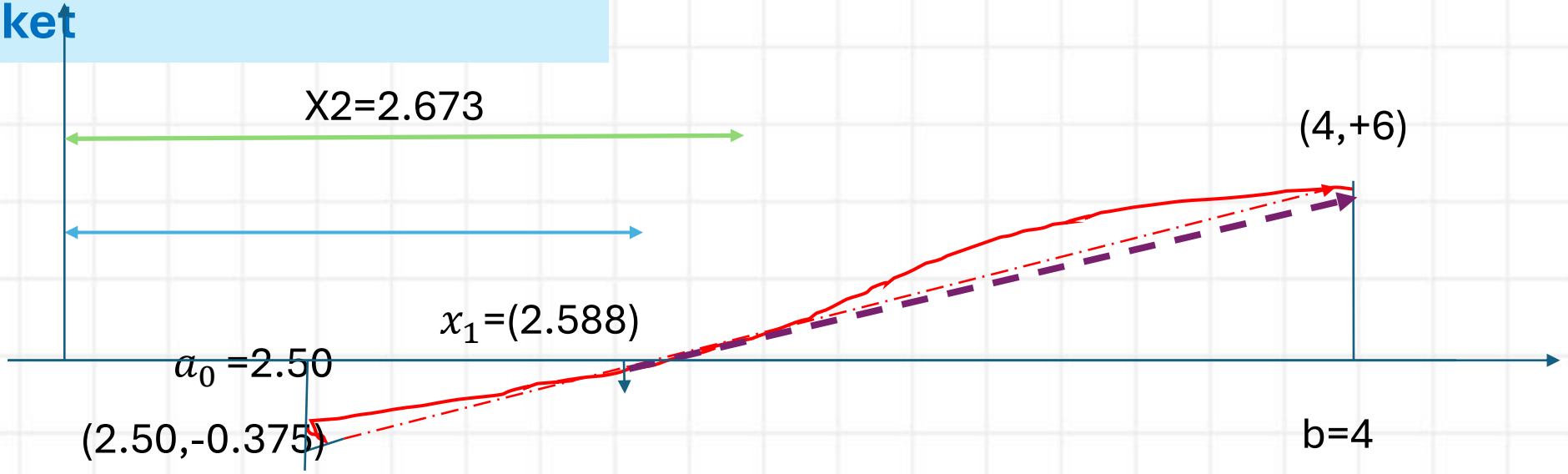
f(2.866)*f(4)=-0.216*(+6)= -1.9255

Left bracket

f(2.866)*f(4)=-0.216*(+6)= -1.9255

Left bracket

Proceed to X6



X1=2.588 {

X2 =2.673 {

X3 = 2.749 {

X4=2.8147 {

X5=2.866

Iteration will continue till x =3.00 after 20 iteration

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Spread sheet data used for approximation

			F(x)	(b*f(a)-a*f(b)	f(a)-f(b)	x value estimated	f(a)*f(b)
iteration	a0	2.5	-0.37500	-16.5	-6.375	2.58824	-2.25
1st	a1	2.588	-0.38469	-17.068186	-6.385	2.67330	-2.308
2	a2	2.673	-0.36807	-17.512073	-6.368	2.74998	-2.208
3	a3	2.750	-0.32814	-17.812436	-6.328	2.81480	-1.969
4	a4	2.815	-0.27386	-17.984218	-6.274	2.86653	-1.643
5	a5	2.867	-0.21587	-18.062683	-6.216	2.90590	-1.295
6	a6	2.906	-0.16247	-18.085275	-6.162	2.93474	-0.975
7	a7	2.935	-0.11802	-18.080524	-6.118	2.95529	-0.708
8	a8	2.955	-0.08351	-18.065788	-6.084	2.96963	-0.501
9	a9	2.970	-0.05800	-18.04978	-6.058	2.97950	-0.348
10	a10	2.979	-0.03975	-18.035996	-6.040	2.98621	-0.239
11	a11	2.986	-0.02700	-18.025302	-6.027	2.99076	-0.162
12	a12	2.991	-0.01823	-18.017465	-6.018	2.99381	-0.109
13	a13	2.994	-0.01226	-18.011914	-6.012	2.99587	-0.074
14	a14	2.996	-0.00822	-18.008065	-6.008	2.99724	-0.049
15	a15	2.997	-0.00550	-18.005431	-6.005	2.99816	-0.033
16	a16	2.998	-0.00368	-18.003645	-6.004	2.99877	-0.022
17	a17	2.999	-0.00245	-18.002441	-6.002	2.99918	-0.015
18	a18	2.999	-0.00164	-18.001632	-6.002	2.99945	-0.01
19	a19	2.999	-0.00109	-18.00109	-6.001	2.99964	-0.007
20		3.000	-0.00073	-18.000728	-6.001	2.99976	-0.004
21		3.000	-0.00049	-18.000486	-6.000	2.99984	-0.003
22		3.000	-0.00032	-18.000324	-6.000	2.99989	-0.002
23							
	b0	4	6				

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